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ADDITIVE FOR COSMETICS, ETC.  
[Keshohinto no Tenkazai]

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## 1. Title

Additive for Cosmetics, etc.

## 2. Claims

1. An additive for cosmetics, etc., that contains  $\beta$ -1,3-1,6-linked glucan.

2. The additive for cosmetics, etc., stated in Claim 1, wherein the  $\beta$ -1,3-1,6-linked glucan includes  $\beta$ -1,3-1,6-linked glucan that is produced by microorganisms.

## 3. Detailed Description of the Invention

[Industrial Field of Application]

The present invention pertains to an additive for cosmetics, etc. More specifically, it pertains to an additive that utilizes the excellent film-forming, moisturizing, nontacky, dispersible, nonadhesive, anti-inflammatory, and nontoxic properties of  $\beta$ -1,3-1,6 glucan obtained by culturing microorganisms (Genus Aureobacidium) and that is used for cosmetics, hairdressings, bath soap, shampoos, ointments, and the like.

[Prior Art]

Cosmetics, etc., must have an excellent film-forming property and moisturizing property so as to add more value to them as commercial products. For the purpose of imparting the film-forming property,

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\* Number in the margin indicates pagination in the foreign text.

moisturizing property, etc., it has been a common practice to add starches or substances similar to them as well as pullulan, hyaluronic acid, etc.

[Problems that the Invention Intends to Solve]

Cosmetics, etc., that contain these components, however, may not be agreeable to the skin of some people, causing itchiness or rashes.

[Means of Solving the Problems]

The present inventors have proposed in JP-A-S60-27395 and A-S60-41497 that a broth that contains  $\beta$ -1,3-1,6 glucan and fructooligosaccharides (mainly 1-kestose and nistose) and that exhibits viscousness specific to  $\beta$ -1,3-1,6 glucan can be produced by /52 liquid culture of the Aureobacidium, sp FERM-P.No 457, ATCC. No. 20524, and IFO. No. 7757 fungi in a medium comprised of rice bran, Vitamin C (ascorbic acid), and sucrose.

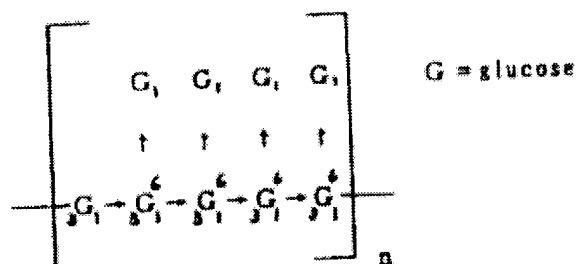
The present inventors found that, when this  $\beta$ -1,3-1,6 glucan in the form of an aqueous solution, for example, a 0.1 to 0.2 % aqueous solution, was applied to the skin or hair as it was, it exhibited, on the skin or hair, a film-forming property and moisturizing property that were superior to those of the prior-art additives for cosmetics, hairdressings, or ointments, thus preventing the skin or hair from drying and keeping them supple, and also learned that it yielded a pleasant feeling when used. Furthermore, the inventors also learned that it was highly safe, with no acute toxicity or subacute toxicity,

and did not cause local irritation, lesion, and cumulative irritation; thus, the present invention was achieved.

Namely, the present invention is an additive for cosmetics, etc., that contains  $\beta$ -1,3-1,6-linked glucan.

The main structural sugar of  $\beta$ -1,3-1,6 glucan is glucose, its linkage is the  $\beta$  linkage, its main chain is  $\beta$ -1,3-linked, and the nonreducing terminals are branched by  $\beta$ -1,6 linkage. It is a macromolecular polysaccharide that contains 38 to 43 % of nonreducing terminals and also contains 4.0 to 6.0 % of phosphoric acid.

Its molecular structure is shown below.



The phosphoric acid group bonds with the  $\beta$ -1,6-linked nonreducing terminal glucose by ester linkage. Its main chain has a triple helix structure. Its molecular weight (number average) is 100,000 to 500,000 (370,000 on average), and the limiting viscosity of its aqueous solution is  $[\eta] = 1.0$  to  $3.5$  ( $24^\circ \text{C}$ ) at  $25^\circ \text{C}$  [sic]. The main physicochemical characteristics of this polysaccharide are derived from the  $\beta$ -1,6-linked nonreducing terminal glucose. Incidentally, the nonreducing terminal residues in common macromolecular polysaccharides (plants or microorganisms) are 1.0 % or less.

As described in the foregoing, this polysaccharide has quite unique properties that are defined by its chemical makeup. More specifically, it has film-forming, moisturizing, nontacky, dispersible, nonadhesive, anti-inflammatory, and nontoxic properties.

When this  $\beta$ -1,3-1,6 glucan is formulated into an aqueous solution, for example, a 0.1 to 0.2 % aqueous solution, and applied as it is to the skin or hair, it exhibits, on the skin or hair, a film-forming property and moisturizing property that are superior to those of the prior-art additives for cosmetics, hairdressings, or ointments, thus preventing the skin or hair from drying and keeping them supple, and it not only yields a pleasant feeling when used but also is highly safe, with no acute toxicity or subacute toxicity, and does not cause local irritation, lesion, and cumulative irritation.

In the case of using the  $\beta$ -1,3-1,6 glucan as an additive for cosmetics, etc., as described in the foregoing, it can be used for any kind of cosmetics, utilizing its physicochemical properties, but it is especially suitable as a component of additives for skin lotions, hairdressings, and ointments.

More specifically, in addition to its thickening property, skin lotions can utilize its nonadhesive and nontacky properties to yield a pleasant feeling in use and to make the resulting lotion more spreadable, and its moisturizing property is utilized to prevent the skin from drying and to maintain suppleness. Hairdressings can utilize

its nontackiness, film-forming property, and moisturizing property. Ointments can utilize its anti-inflammatory and film-forming properties.

In the present invention, when the  $\beta$ -1,3-1,6 glucan is used as a cosmetic, hairdressing, or ointment additive, it may be used with other macromolecular substances that are commonly used for the formulation of cosmetics.

This glucan may also be used, with no specific limitation, in combination with other low-molecular compounds, inorganic compounds, perfumes, preservatives, etc., as well as various other types of substances.

The  $\beta$ -1,3-1,6 glucan is obtained by liquid culture of microorganisms, specifically, Genus Aureobacidium, sp, using sucrose as the carbon source, and by subsequent sterilization and centrifugation of the obtained culture medium. The centrifuged solution may be used as it is or may undergo polysaccharide separation and refining with an organic solvent and then used as an aqueous solution. The glucan can be prepared with an appropriate degree of purity for the application.

#### [Effects of the Invention]

When the additive of the present invention is added to cosmetics, etc., it not only thickens the cosmetics but also makes them more pleasant to use owing to its nontackiness and nonadhesive property. It

also makes cosmetics more spreadable, and its moisturizing property prevents the skin, hair, etc., from drying and maintains their suppleness.

Hairdressings can utilize its nontackiness, film-forming property, 53 and moisturizing property.

When used as an ointment additive, its anti-inflammatory property and film-forming property can be utilized.

[Working Examples]

The following explains the present invention in further detail, referring to working examples. Mixing ratios in the working examples are expressed in % by weight.

Working Example 1

Using  $\beta$ -1,3-1,6 glucan as an additive, a skin lotion was prepared with the following mixing ratios.

	Mixing Ratio %
Propylene glycol	3.00
Ethanol	10.00
Polyoxyethylene hydrogenated castor oil	0.40
( $\beta$ -1,3-1,6 glucan)	0.02
Perfume	0.60
Purified water	85.98

The skin lotion pertaining to the present invention was prepared by blending the aforesaid components in a usual manner.



The skin lotion obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well, did not easily dry, and also imparted suppleness.

#### Working Example 2

Using  $\beta$ -1,3-1,6 glucan as an additive, a hair cream was prepared with the following mixing ratios.

	Mixing Ratio %
Polyoxyethylene lanolin	2.50
Polyoxyethylene butyl ether	20.00
Polyoxyethylene oleyl ether	2.50
Isopropyl palmitate	9.00
White vaseline	3.00
Ethanol	2.00
Sodium hydroxide	0.02
1,3-butylene glycol	3.00
Carboxyvinyl polymer	0.50
Sodium benzoate	0.30
Perfume	0.80
( $\beta$ -1,3-1,6 glucan)	0.02
Purified water	50.38

The hair cream pertaining to the present working example was prepared by blending the aforesaid components in a usual manner.

The hair cream obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well, did not easily dry, and also imparted suppleness.

### Working Example 3

Using  $\beta$ -1,3-1,6 glucan as an additive, a hairblow agent was prepared with the following mixing ratios.

	Mixing Ratio %
Polyoxyethylene hydrogenated castor oil (60 E.O.)	0.30
Stearyl trimethyl ammonium chloride (60 %)	0.35
( $\beta$ -1,3-1,6 glucan)	0.01
Polyoxyethylene oxide	0.03
Polyether-modified silicone	0.20
Brucine-modified ethanol (95 degrees)	20.00
Perfume	0.30
Purified water	78.81

The hairblow agent pertaining to the present working example was prepared by blending the aforesaid components in a usual manner.

The hairblow agent obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well, did not easily dry, and also imparted suppleness.

#### Working Example 4

Using  $\beta$ -1,3-1,6 glucan as an additive, a moisturizing milk was obtained with the following mixing ratios.

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	Mixing Ratio %
( $\beta$ -1,3-1,6 glucan)	0.05
Glycerin	0.50
1,3-butylene glycol	0.50
Potassium hydroxide	0.20
Stearic acid	1.00
White vaseline	3.00
Polyoxyethylene monostearate	0.90
Sorbitan (20 E.O) self-emulsifying glycerin monostearate	0.50
Behenyl alcohol	0.50
Bleached beeswax	0.50
Isopropyl palmitate	1.00
Refined lanolin	1.00
Liquid paraffin	1.50
Neopentyl glycol di-2-ether hexanoate	4.20
Perfume	0.10
Purified water	84.55

The moisturizing milk pertaining to the present working example was prepared by blending the aforesaid components in a usual manner.

The moisturizing milk obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well and did not easily dry.

#### Working Example 5

Using  $\beta$ -1,3-1,6 glucan as an additive, an emollient cream was prepared with the following mixing ratios.

	Mixing Ratio %
( $\beta$ -1,3-1,6 glucan)	0.10
Bleached beeswax	3.20
MC. stearic acid	3.20
Behenyl alcohol	0.70
Refined lanolin	1.00
Self-emulsifying glycerin monostearate	3.50
Polyoxyethylene sorbitan monostearate sorbitan (20 E.O.)	0.70
n-hexadecyl-2-ethyl hexanoate	10.0
Squalane	10.0
Cetyl-2-ethyl hexanoate	5.0
Perfume	0.30
1,3-butylene glycol	4.00
Methyl paraoxybenzoate	0.30

Purified water	58.00
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The emollient cream pertaining to the present working example was prepared by blending the aforesaid components in a usual manner.

The emollient cream obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well and did not easily dry.

#### Working Example 6

Using  $\beta$ -1,3-1,6 glucan as an additive, a nourishing cream was obtained with the following mixing ratios.

	Mixing Ratio %
( $\beta$ -1,3-1,6 glucan)	0.20
Squalane	9.00
Vaseline	1.00
Octyldodecyl myristate	3.00
Isopropyl palmitate	2.00
Bleached beeswax	3.00
Cotton wax	1.00
Methyl siloxane	0.50
Stearic acid	1.00
Propylene glycol monostearate	1.40
Emulsifying-type glycerin monostearate	3.50
Methyl paraoxybenzoate	0.20

Butyl paraoxybenzoate	0.05
1,3-butylene glycol	3.00
Perfume	0.30
Purified water	70.85

The nourishing cream pertaining to the present working example was prepared by blending the aforesaid components in a usual manner. The nourishing cream obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. /55 It spread well and did not easily dry.

#### Working Example 7

Using  $\beta$ -1,3-1,6 glucan as an additive, a creme masque was prepared with the following mixing ratios.

	Mixing Ratio %
Bentonite 670	10.00
Titanium oxide	3.50
( $\beta$ -1,3-1,6 glucan)	0.50
1,3-butylene glycol	0.50
Anhydrous glucine-modified alcohol	10.00
Methyl paraoxybenzoate	0.10
Propyl paraoxybenzoate	0.10
Citric acid	0.20
Propylene glycol	5.00
Safflower oil	0.50

dl. pyrrolidone sodium carboxylate	0.20
Purified water	69.40

The creme masque pertaining to the present working example was prepared by blending the aforesaid components in a usual manner. The creme masque obtained in the present working example was viscous but was not sticky and yielded a pleasant feeling when used. It spread well and did not easily dry.

#### Working Example 8

Using  $\beta$ -1,3-1,6 glucan as an additive, an ointment was prepared with the following mixing ratios.

	Mixing Ratio %
Polyoxyethylene cetyether (E.O. 30) (a)	2.00
Glycerin monostearate (emulsifying type) (a)	10.00
Liquid paraffin (a)	10.00
Vaseline (a)	5.00
Preservative, antioxidant (a)	appropriate quantity
( $\beta$ -1,3-1,6 glucan) (b)	0.01 - 2.00
Purified water (b)	Balance to make 100 in total

The aforesaid components were mixed according to the following preparation method pertaining to the present invention.

After the components marked (a) were heated to 80° C and the components marked (b) to 82° C, Components (b) were added to

Components (a) while Components (a) were being stirred, thereby emulsifying by stirring. After the addition was completed, stirring of the mixture was continued while it was cooled until its temperature decrease to 42° C. If a perfume were to be added, it should be added at about 55° C.

The ointment obtained in the present working example had an anti-inflammatory effect and film-forming property.

#### Working Example 9

Using  $\beta$ -1,3-1,6 glucan as an additive, bath soap was prepared with the following mixing ratios.

	Mixing Ratio %
Soap content (a)	69.7
Table salt (a)	0.7
Glycerin (a)	2.5
Free alkali (a)	0.1
Unsaponifiable matter (a)	0.5
Purified water (a)	25.0
( $\beta$ -1,3-1,6 glucan) (b)	1.5

The aforesaid components were mixed according to the following preparation method pertaining to the present invention.

To prepare this bath soap, when the soap base components (a) were in a dissolved state, component (b),  $\beta$ -1,3-1,6 glucan, whose concentration had been adjusted to facilitate blending, was added in a



quantity of 0.01 to 2 % of the soap and stirred well, thereby obtaining bath soap.

The bath soap obtained in the present working example was not sticky and yielded a pleasant feeling when used. It also spread well.

#### Working Example 10

Using  $\beta$ -1,3-1,6 glucan as an additive, a shampoo was obtained with the following mixing ratios.

	Mixing Ratio %
Sodium alkylether sulfate (a)	16.0
Lauric acid diethanol amide (a)	4.0
Preservative, coloring matter, perfume (b)	0.60
( $\beta$ -1,3-1,6 glucan) (b)	1.02
Purified water (b)	78.38

The aforesaid components were mixed according to the following preparation method pertaining to the present invention.

To prepare this shampoo,  $\beta$ -1,3-1,6 glucan was added to the purified water beforehand, to which mixture were then added the preservative, coloring matter, and perfume and stirred well, thereby obtaining a  $\beta$ -1,3-1,6 glucan mixture (b), and this mixture (b) was added to the mixture of Components (a), thus obtaining a shampoo.

The shampoo obtained in the present working example was viscous but not sticky and yielded a pleasant feeling when used. It also spread well and imparted suppleness to the hair.

### Reference Example 1

The  $\beta$ -1,3-1,6 glucan-blended skin lotion and emollient cream obtained in Working Examples 1 and 5, respectively, were evaluated for skin irritancy by comparing them to controls.

Method: test subjects: 22 healthy subjects (age: 20 to 40)

An adhesive plaster for patch-test use (a product of Torii Pharmaceutical Co., small size) was applied in a sealed manner for 24 hours, and the evaluation was carried out visually one hour after the plaster was removed from the subjects' bodies.

Criteria: - : negative      + : clear red spot       $\pm$  : slightly red spot

#### Evaluation Results

Product	No. of subjects	+	$\pm$	-	Positive rate (%)
Skin lotion with no glucan	22	3	8	9	30
$\beta$ -1,3-1,6 glucan (0.02 %) blended skin lotion	22	0	5	15	0
Emollient cream with no glucan	22	1	7	12	10
$\beta$ -1,3-1,6 glucan (0.1 %) - blended emollient cream	22	0	5	15	0

As shown in the above, the blending of  $\beta$ -1,3-1,6 glucan evidently reduced skin irritancy.

### Reference Example 2

The usefulness of the  $\beta$ -1,3-1,6 glucan-blended skin lotion was examined through experiments.

Method: test subjects: 22 women (age: 20 to 40) who complained of dry scaly skin or skin disorders.

Application: twice a day (in the morning and evening) for 30 consecutive days

Evaluation: The evaluation was conducted by asking the following questions regarding the degree of improvement of the skin condition after one month of use in comparison to the skin condition prior to the use.

- (1) Effects on skin disorders
- (2) Effects on skin resilience
- (3) Effects on smoothness of the skin
- (4) Effects on fineness of the skin texture
- (5) Effects on fine wrinkles
- (6) Effects on spots and freckles
- (7) Makeup effects

As shown below, the  $\beta$ -1,3-1,6 glucan-blended skin lotion caused no skin problems and exhibited the remarkable effects of the blending on all the questioned items.

#### Evaluation Results

Item	Skin lotion (Control)	
	Effective Cases	Effective rate (%)
(1)	10	45.4
(2)	8	36.4
(3)	10	45.4
(4)	6	27.3
(5)	5	22.7
(6)	5	22.7

(7)	10	45.4
skin irritancy	Five subjects complained of itchiness.	

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$\beta$ -1,3-1,6 glucan-blended Skin lotion		
Item	Effective Case	Effective rate (%)
(1)	15	68.2
(2)	12	54.5
(3)	15	68.2
(4)	10	45.4
(5)	10	45.4
(6)	8	36.4
(7)	18	81.8
skin irritancy	No problem	